Search for scalar bottom quarks and third-generation leptoquarks in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV.
Extra Figures for public presentations
(Dated: August 26, 2010)

We report the results of a search for pair production of scalar bottom quarks ($\tilde{b}_1$) and third-generation leptoquarks in 5.2 fb^{-1} of $p\bar{p}$ collisions at the D0 experiment of the Fermilab Tevatron Collider. Scalar bottom quarks are assumed to decay to a neutralino ($\tilde{\chi}_1^0$) and a b quark, and we set 95% C.L. lower limits on their production in the ($m_{\tilde{b}_1}, m_{\tilde{\chi}_1^0}$) mass plane such as $m_{\tilde{b}_1} > 247$ GeV for $m_{\tilde{\chi}_1^0} = 0$ and $m_{\tilde{\chi}_1^0} > 110$ GeV for $160 < m_{\tilde{b}_1} < 200$ GeV. The leptoquarks are assumed to decay to a tau neutrino and a b quark with branching fraction B, and we set a 95% C.L. lower limit of 247 GeV on the mass of a charge-1/3 third-generation scalar leptoquark for $B = 1$.

I.   EXTRA FIGURES.
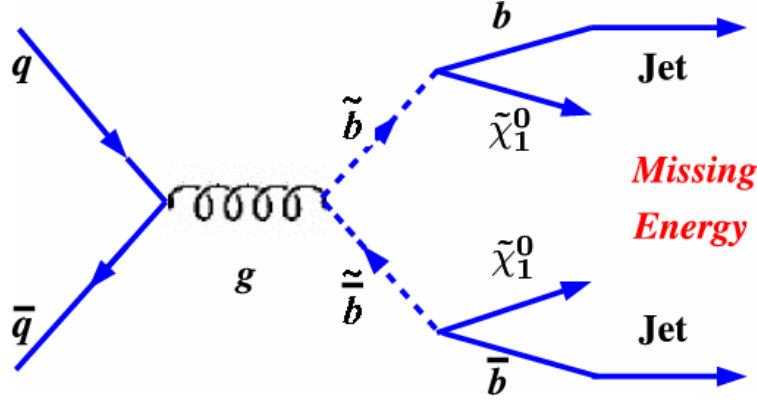
Figures $1 - 7$ are proposed for public talks.

FIG. 1: Feynman diagram of the $\tilde{b}_1\bar{\tilde{b}}_1 \rightarrow b\tilde{\chi}_1^0\bar{b}\tilde{\chi}_1^0$ process
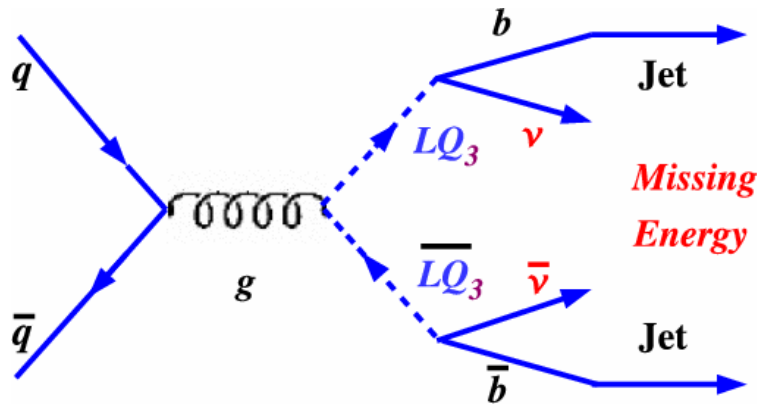

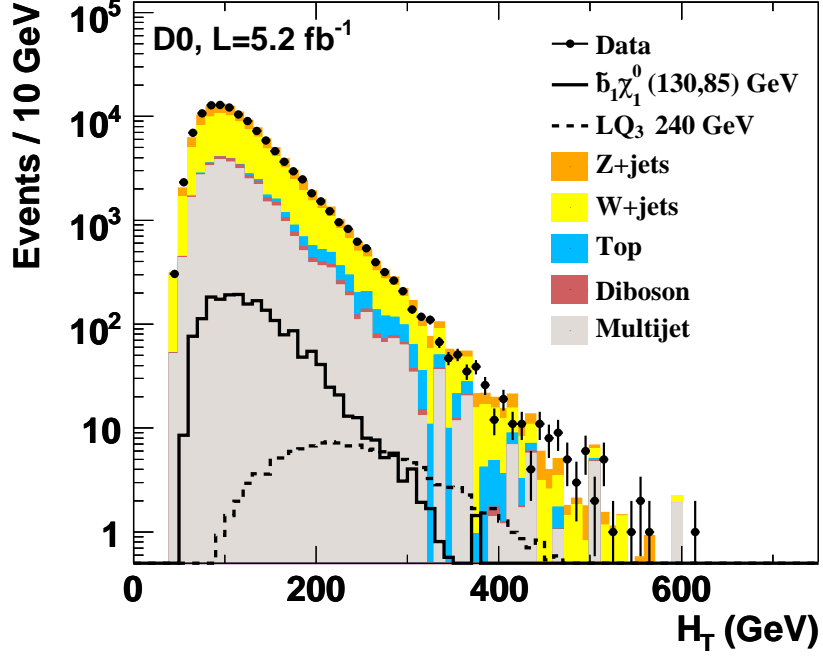FIG. 2: Feynman diagram of the $LQ_3\bar{LQ}_3 \rightarrow b\bar{b}\nu\bar{\nu}$ process.

FIG. 3: The H_T distribution in the signal sample before b-tagging. The points with the error bars represent data while the shaded histograms show the individual contributions of the background processes. Signals with $(m_{\tilde{b}_1}, m_{\tilde{\chi}_1^0}) = (130,85)$ GeV and $m_{LQ} = 240$ GeV are shown as solid and dashed lines, respectively.
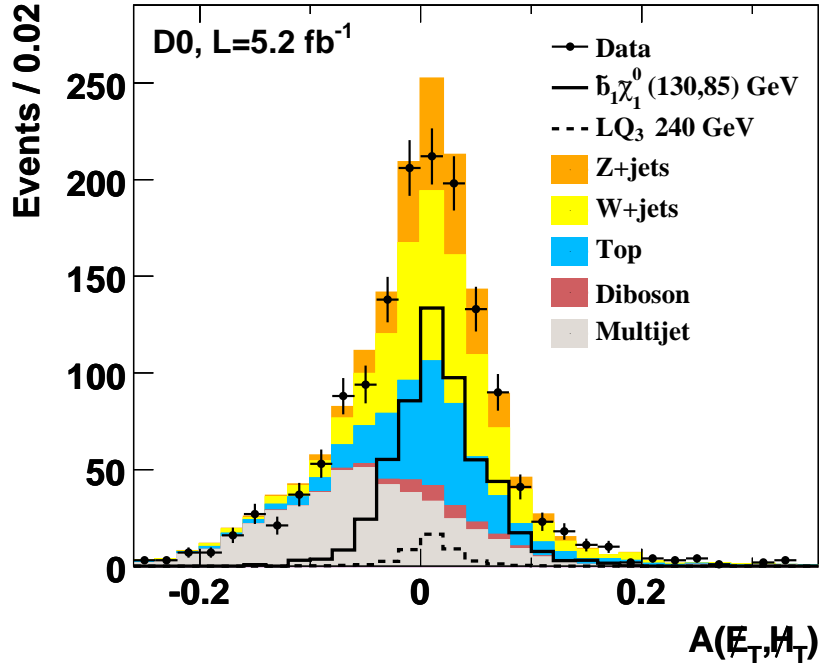

FIG. 4: The $A(\not{E}_T, \not{H}_T) \equiv (\not{E}_T - \not{H}_T)/(\not{E}_T + \not{H}_T)$ distribution after b-tagging. The points with the error bars represent data while the shaded histograms show the individual contributions of the background processes. Signals with $(m_{\tilde{b}_1}, m_{\tilde{\chi}_1^0}) = (130,85)$ GeV and $m_{LQ} = 240$ GeV are shown as solid and dashed lines, respectively.
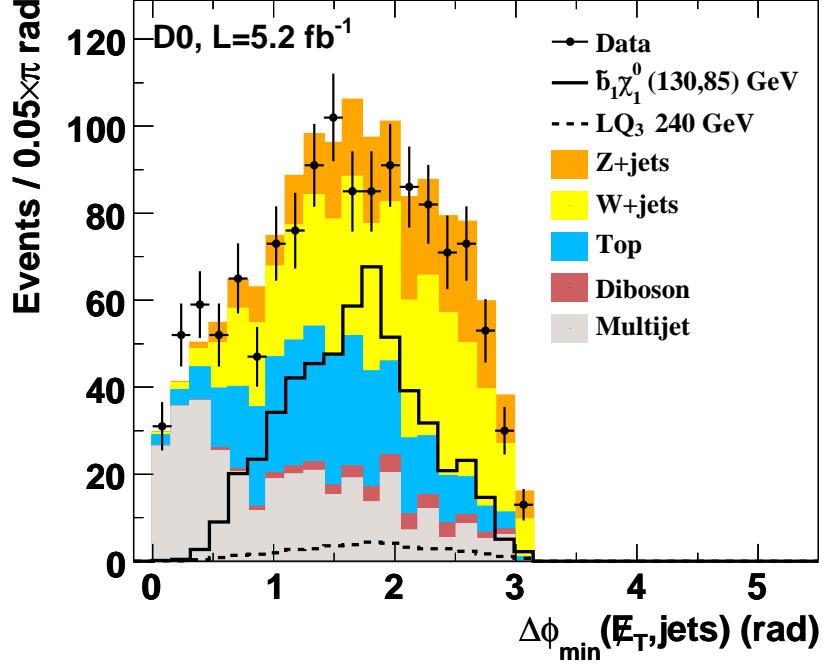
FIG. 5: The $\Delta\phi_{min}(\not{E}_T, jets)$ distribution after b-tagging and the $0.1 < A(\not{E}_T, \not{H}_T) < 0.2$ requirement. The points with the error bars represent data while the shaded histograms show the individual contributions of the background processes. Signals with $(m_{\tilde{b}_1}, m_{\tilde{\chi}_1^0})=(130,85)$ GeV and $m_{LQ} = 240$ GeV are shown as solid and dashed lines, respectively.
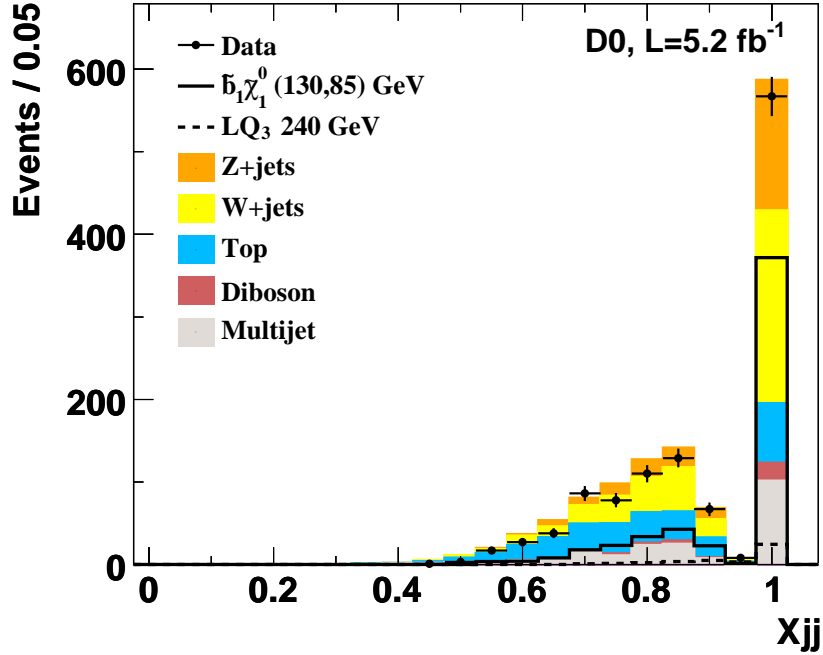

FIG. 6: The $X_{jj} = ((E_T^{jet1} + E_T^{jet2})/H_T)$ distribution after b-tagging and the $0.1 < A(\not{E}_T, \not{H}_T) < 0.2$ and the $\Delta\phi_{min}(\not{E}_T, jets) > 0.6$ rad requirements. The points with the error bars represent data while the shaded histograms show the individual contributions of the background processes. Signals with $(m_{\tilde{b}_1}, m_{\tilde{\chi}_1^0})=(130,85)$ GeV and $m_{LQ} = 240$ GeV are shown as solid and dashed lines, respectively.
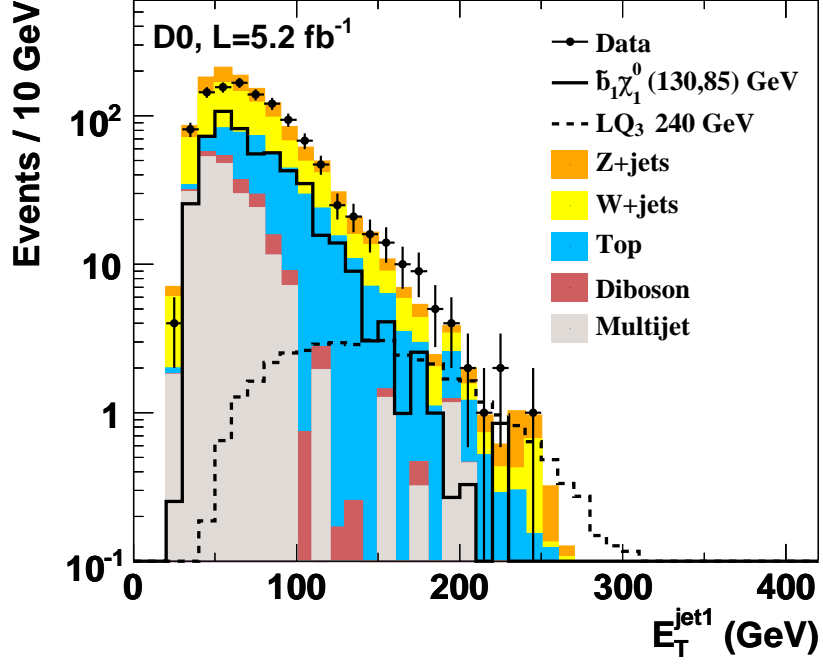
FIG. 7: The leading jet E_T distribution after after b-tagging and the $0.1 < A(\not{E}_T, \not{H}_T) < 0.2$ and $\Delta\phi_{min}(\not{E}_T, jets) > 0.6$ rad requirements. The points with the error bars represent data while the shaded histograms show the individual contributions of the background processes. Signals with $(m_{\tilde{b}_1}, m_{\tilde{\chi}_1^0})$=(130,85) GeV and $m_{LQ} = 240$ GeV are shown as solid and dashed lines, respectively.
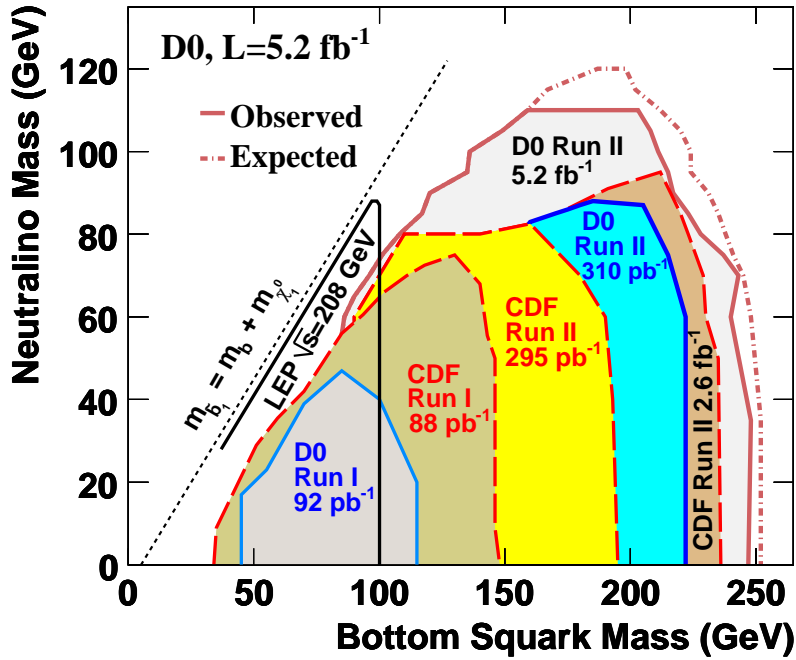

FIG. 8: The 95% C.L. exclusion contour in the $(m_{\tilde{b}_1}, m_{\tilde{\chi}_1^0})$ plane. Also shown are results from previous searches at LEP [1] and the Tevatron [2, 3].

[1] LEPSUSYWG: ALEPH, DELPHI, L3, and OPAL Col- laborations, http://lepsusy.web.cern.ch/lepsusy, Report No. LEPSUSYWG/04-02.1.

[2] V.M. Abazov *et al.* (D0 Collaboration), Phys. Rev. Lett. **97**, 171806 (2006); V.M. Abazov *et al.* (D0 Collaboration), Phys. Rev. D **60**, R031101 (1999).

[3] T. Aaltonen *et al.* (CDF Collaboration), Phys. Rev. Lett. **76**, 072010 (2007); T. Affolder *et al.* (CDF Collaboration), Phys. Rev. Lett. **84**, 5704 (2000). T. Aaltonen *et al.* (CDF Collaboration), Phys. Rev. Lett. **105**, 081802 (2010).